US009335056B1

(12) **United States Patent**
Lomicka et al.

(10) **Patent No.: US 9,335,056 B1**
(45) **Date of Patent: May 10, 2016**

(54) **ELECTROMECHANICAL ASSEMBLY FOR OVEN DOOR LATCHING**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 140 days.

(21) Appl. No.: **14/173,704**

(22) Filed: **Feb. 5, 2014**

(51) **Int. Cl.**

E05C 1/06	(2006.01)
F24C 15/02	(2006.01)
E05B 47/00	(2006.01)
E05C 1/08	(2006.01)
E05C 3/04	(2006.01)

(52) **U.S. Cl.**
CPC ***F24C 15/022*** (2013.01); ***E05B 47/0012*** (2013.01); ***E05C 1/08*** (2013.01)

(58) **Field of Classification Search**
CPC Y10S 292/69
USPC ..... 292/144, 201, DIG. 69
See application file for complete search history.

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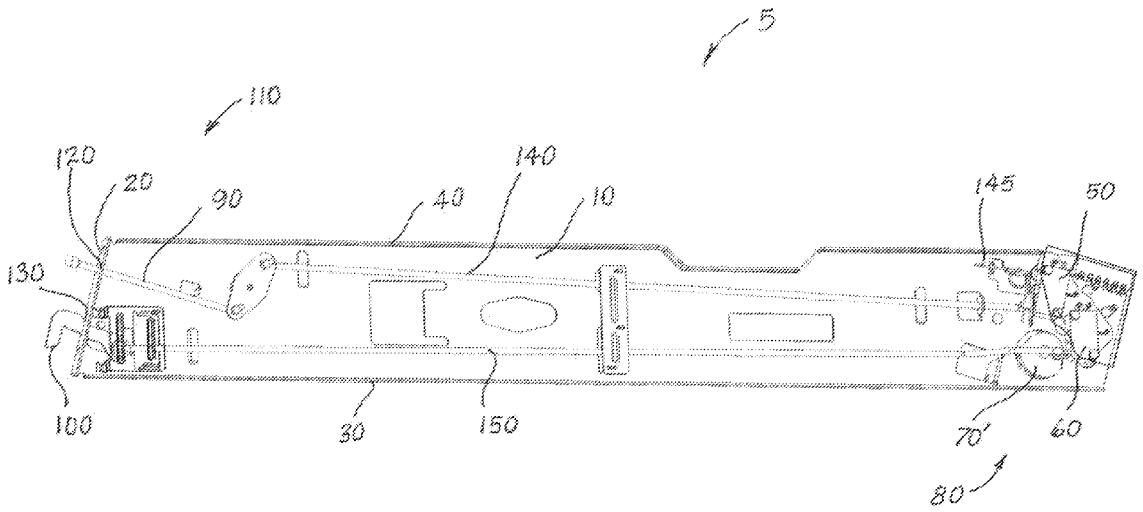
(57) **ABSTRACT**

A latching assembly uses a flat sheet metal chassis with a first and a second electrical switches, an electrical motor driving an eccentric cam, a push rod, a hook, a spring, and a first and a second actuator rods. When the push rod is moved axially by an outside force it opens a circuit connection held closed by the spring on the push rod. This allows current flow to a motor which drives the eccentric cam and pushes an actuator rod to move axially against a hook causing it to move from a first, non-latching position to a second, latching position. The assembly is useful for latching an oven when at high temperature.

17 Claims, 5 Drawing Sheets



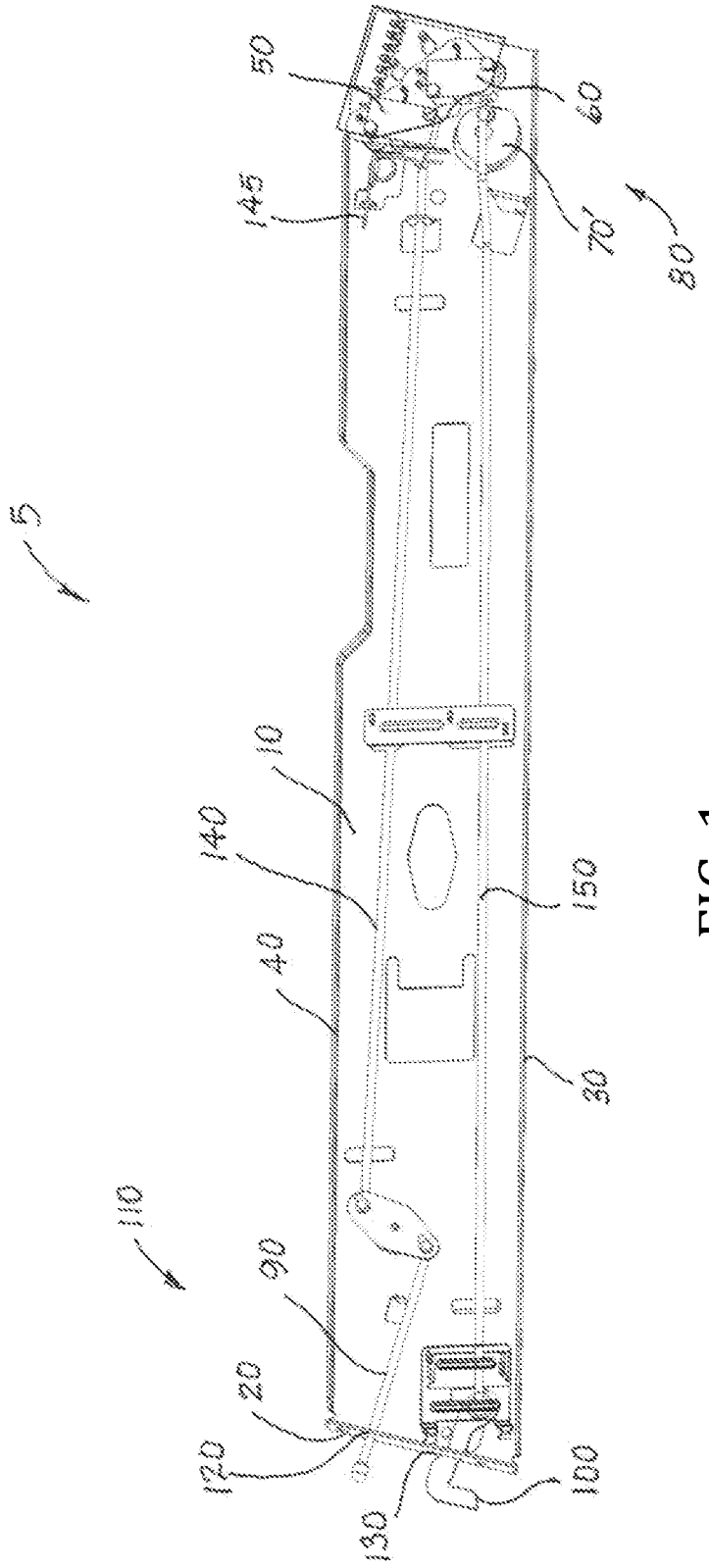


FIG. 1

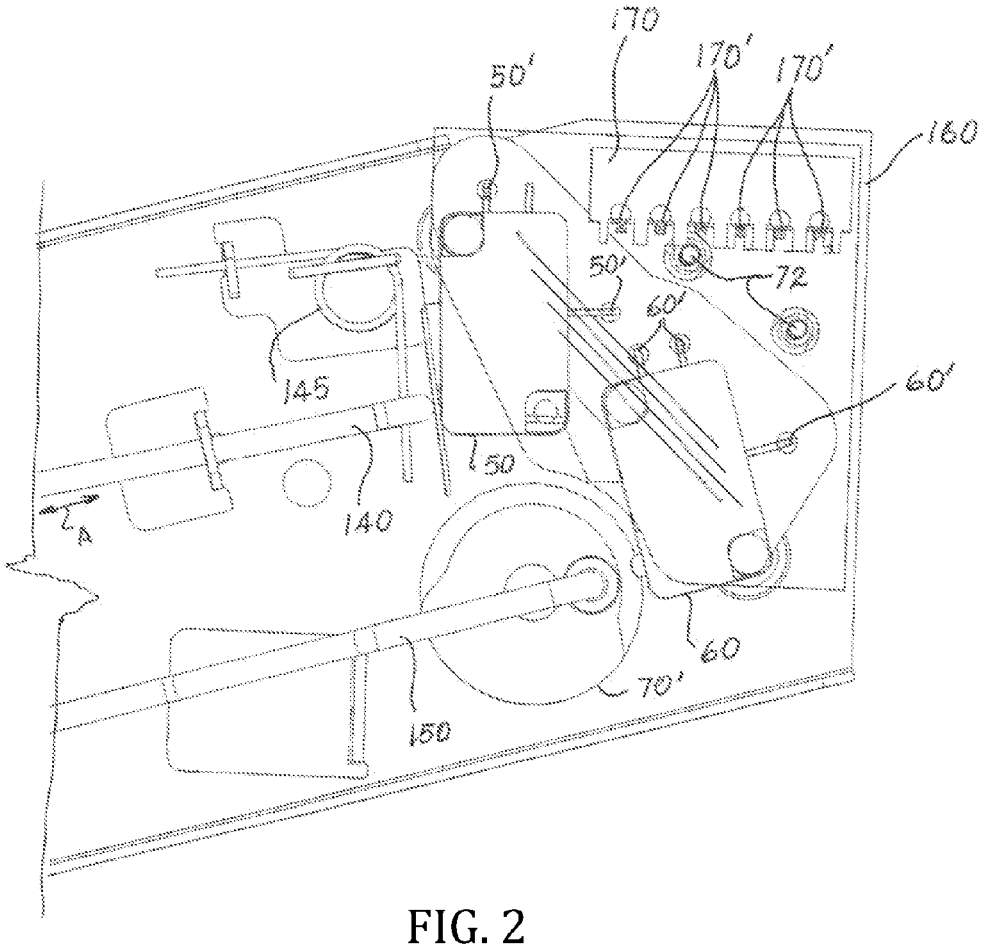


FIG. 2

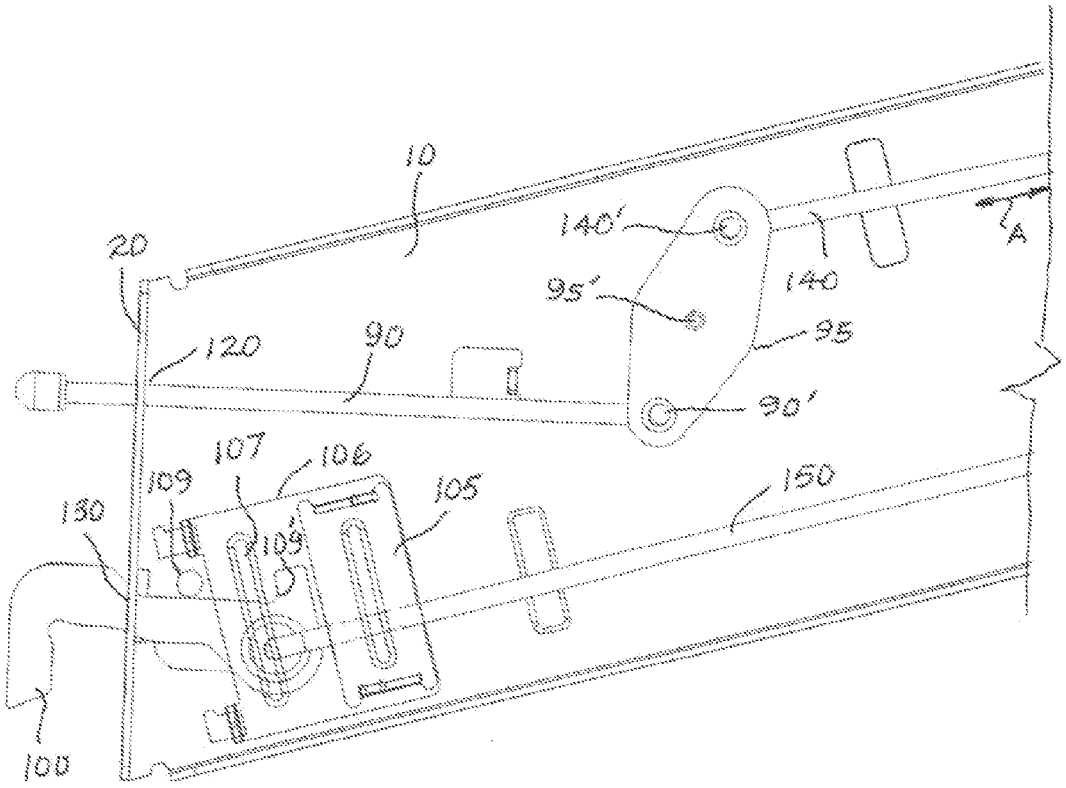


FIG. 3

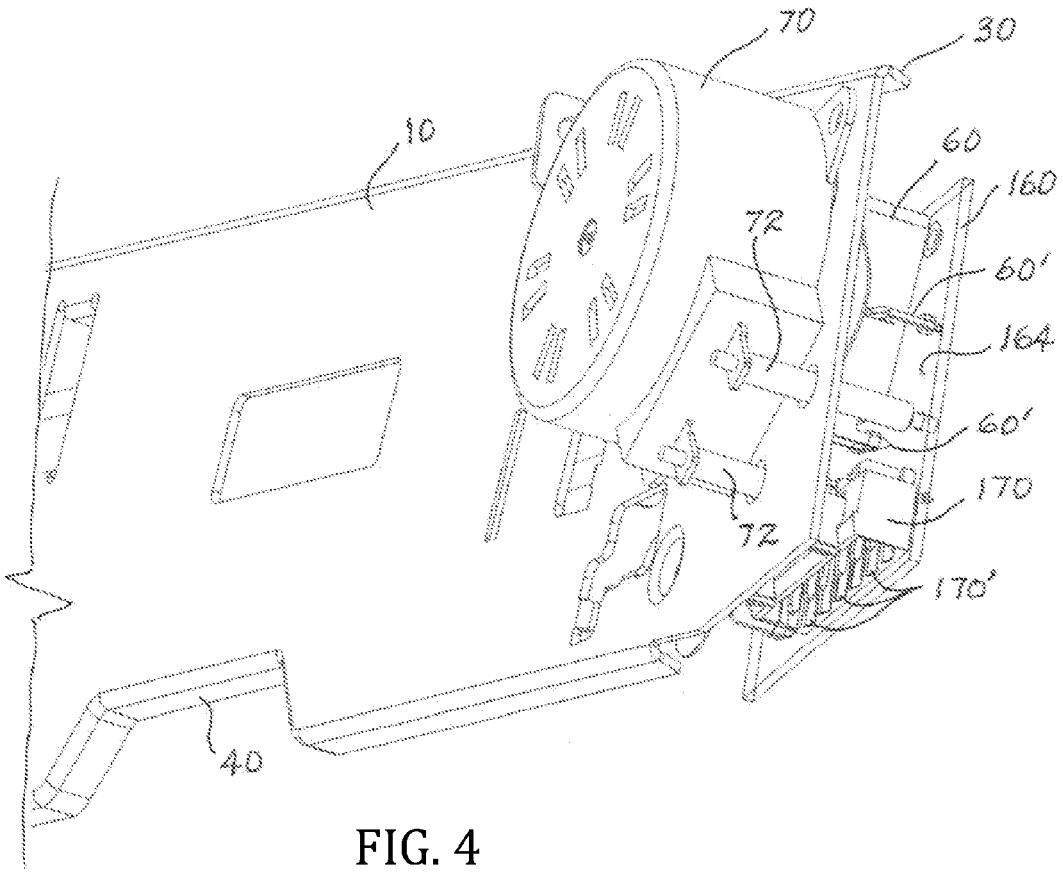


FIG. 4

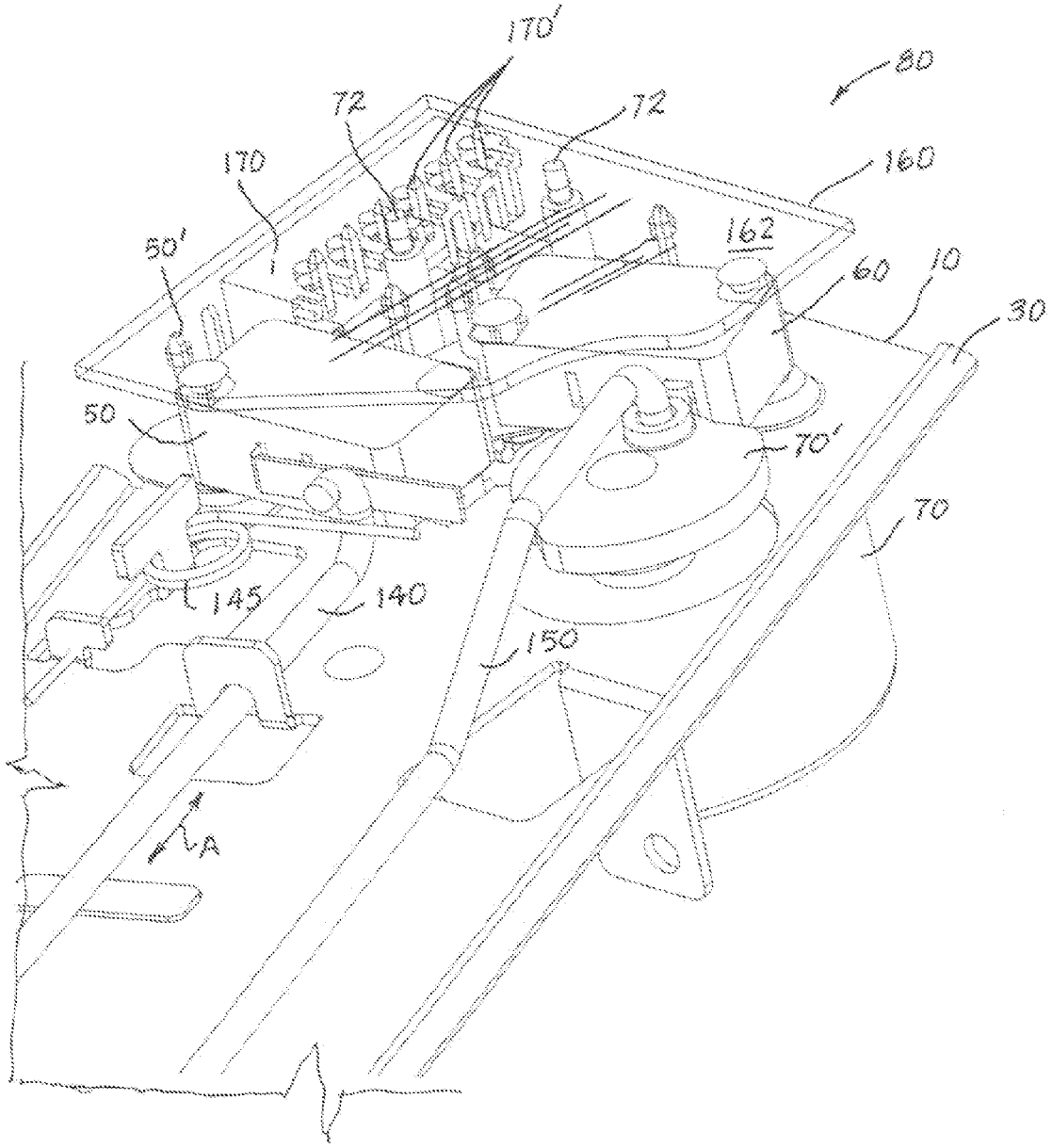


FIG. 5

ELECTROMECHANICAL ASSEMBLY FOR OVEN DOOR LATCHING

BACKGROUND

This disclosure relates to the field of mechanical controls especially for large appliances such as household cooking ranges and ovens. Such ovens may have a self-cleaning feature wherein high temperature is used to burn-off organic materials left in the oven from cooking spills and residues. In this case, the oven door must be locked during such high-temperature cleaning as a safety measure. The door must not be able to be opened until temperature within the oven is within a safe range. Conventional issues that arise with the electromechanical assemblies now in use on cooking stoves, ranges and ovens include difficulty in connecting multiple wire-harness connectors to their respective socket ports on the assembly, waste of assembly time in the latter activity, electromagnetic interference from motors on or near the assembly causing false signals, and complexity and time requirements of point-to-point wiring. This disclosure defines improvements to such interlocking assemblies; improvements that overcome the above described problems saving assembly time, reducing assembly errors, and improving operational performance as well as other benefits.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

FIG. **1** is an example front perspective view of the presently described apparatus;

FIG. **2** is a proximal portion taken from FIG. **1**;

FIG. **3** is a distal portion taken from FIG. **1**;

FIG. **4** is a rear perspective view of proximal portion shown in FIG. **2**; and

FIG. **5** is a further proximal front perspective view as in FIG. **2**.

Like reference symbols in the various drawings indicate like elements.

DETAILED DESCRIPTION

The presently described oven door latching assembly **5** is mounted as a part of an appliance (not shown) such as a cooking stove or oven. It is positioned within the appliance in a position where it is able to safely lock an oven door during high temperature operations such as oven cleaning.

As shown in FIG. **1**, assembly **5** may be constructed with a rectangular sheet metal chassis **10** which may be an elongated, generally flat part which may have flanges **20**, **30**, **40** on three sides providing rigidity and other benefits. FIG. **1** shows a front face of chassis **10**. Electrical switches and a motor may be fixedly mounted at a proximal end **80** of chassis **10** and a push rod and a hook may be movably mounted at an opposing distal end **110**.

As shown in FIG. **2** electrical switches **50** and **60**, and an electrical motor **70** (FIG. **4**) may be fixedly mounted to chassis **10** at the proximal end **80**. A push rod **90** and a hook **100** may be movably mounted at the distal end **110** and both push rod **90** and hook **100** may extend outwardly from the distal end **110** through penetrations **120** and **130** in flange **20** as shown in FIG. **3**. Actuator rods **140** and **150** may be secured on chassis **10** in a manner that enables them to move axially. The actuator rod **140** is secured for axial motion so as to transfer force between push rod **90** and switch **50**. The actuator rod **150** is secured for axial motion so as to transfer force between motor **70** and hook **100**.

FIGS. **4** and **5** show that a printed circuit board **160** is mounted on switch **60** above, and spaced apart from, chassis **10**, and a connector port **170** may be mounted on the front face of chassis **10**. The electrical connector pins **170'** of port **170** may extend into, and penetrate through, board **160** as is shown in FIG. **5**. Switches **50** and **60** also may have electrical terminals **50'** and **60'** respectively, which may extend through board **160**. Board **160** may carry passive electrical components such as fuses, capacitors, and resistors (not shown). Such a circuit on surface **162** may be subjected to electromagnetic fields and electrical transients induced by switches **50** and **60**, and especially by motor **70**. The underside **164** of board **160** may be metal coated so as to form a conductive ground plane and electromagnetic shield which may protect against transient electromagnetic fields produced by the operation of switches **50** and **60**, and motor **70**.

FIG. **3** shows by arrow "A" that actuator rod **140** is able to translate axially. In FIGS. **2** and **5** it is shown that spring **145** presses rod **140** against a lever of switch **50**, whereby rod **140** is in a proximal position. Now, moving distally, in FIG. **3**, it is shown that actuator rod **140** pivotally engages push rod **90** through rotational link **95** which may rotate about pivotal axle **95'** which may be rotationally fixed to chassis **10**. Pivot axles **90'** and **140'** may rotationally fasten push rod **90** and actuator rod **140** respectively to link **95**. Therefore, as can be seen that a terminal end of, push rod **90** may be extended distally away from flange **20**. Link **95** may function to reverse a directional sense of rod **90** so that when rod **140** moves proximally (to the right in FIG. **3**), rod **90** moves distally (to the left in FIG. **3**).

FIG. **5** shows that actuator rod **150** may be engaged with eccentric cam **70'** which may be rotated by motor **70**. With cam **70'** in the position shown in FIG. **5**, rod **150** is at its proximally terminal location. As shown in FIG. **3**, the distal end of rod **150** may engaged slot **107** so that as cam **70'** rotates, rod **150** and hook **100** both may move along slot **107**. Sheet metal bridge **105** may be positioned over rod **150** preventing it from disengaging from slot **107**. As the distal end of rod **150** moves along slot **107** hook **100** extends outward from flange **20** until curve **109'** engages peg **109** at which time both hook **100** and rod **150** are in their distally extreme positions whereupon hook **100** may engage a door latch (not shown) thereby securing an oven door in its sealed position. As the oven door is closed, it pushes rod **90** in the proximal direction thereby releasing the lever of switch **50** (electrical open) thereby signaling that the oven door is secured and that it is acceptable to energize motor **70** to cause latching as described above. This sequence of events is triggered when the oven door is closed and a console button is depressed to generate an electrical signal for high temperature cleaning. This signal is transmitted through pins **170'** of connector port **170** via a plug on a wire harness (not shown) and then through printed circuit conductive paths on circuit board **160** to energize motor **70** through switch **60**.

Assembly **5** is constructed in a manner that improves assembly speed in production by reducing the amount of labor and the number of parts that are required and thereby avoiding assembly errors which are common in the art. Assembly **5** also provides simplified operation as compared with current prior art devices in use. Additionally, the transmission of transient electrical signals are prevented from affecting the electrical circuit on board **160**.

Embodiments of the subject apparatus and method have been described herein. Nevertheless, it will be understood that various modifications may be made without departing from the spirit and understanding of this disclosure. Accordingly, other embodiments and approaches are within the scope of the foregoing.

What is claimed is:

1. A latching apparatus having a proximal end and a distal end and movable between a non-latching state and a latching state, the latching apparatus comprising:

a door, a first electrical switch, a second electrical switch, an electrical motor driving an eccentric cam, a push rod having a proximal end and a distal end, a hook, a spring, and a first actuator rod and a second actuator rod having a proximal end and a distal end;

wherein when the latching apparatus is in the non-latching state:

the first actuator rod is in a proximal position wherein:

a. the proximal end of the first actuator rod is engaged with the spring, the spring being in a relaxed state, thereby making contact with the first electrical switch to form a first closed electrical circuit with the first electrical switch, and

b. the distal end of the first actuator rod is engaged with the proximal end of the push rod by a pivoting link member, the push rod being in a distal position; and

the second actuator rod is in a proximal position wherein:

c. the proximal end of the second actuator rod is engaged with the eccentric cam, the eccentric cam being in contact with but not activated by the second switch, and

d. the distal end of the second actuator rod is engaged with the hook, the hook being in a non-latching state; and

wherein when the latching apparatus is in the latching state:

the first actuator rod is in a distal position wherein:

a. the door of the apparatus will engage the push rod, so as to move the push rod toward a proximal position and wherein movement of the push rod actuates the first actuator rod to move to a distal position causing the proximal end of the first actuator rod, engaged with the spring, to break contact with the first electrical switch to form an electrical open and

b. the distal end of the first actuator rod is engaged with the proximal end of the push rod by a pivoting link member in a manner which allows the push rod to be in a proximal position; and

the second actuator rod is in a distal position wherein:

c. the proximal end of the second actuator rod, engaged with the eccentric cam, is in contact with and is activated by the second switch to axially translate the second actuator rod to the distal position, and

d. the distal end of the second actuator rod, engaged with the hook, moves the hook to a latching position

wherein, when the pushrod is moved towards the proximal end of the latching apparatus, the first electrical circuit formed by the first switch is broken thereby causing rotation of the electric motor and thereby forming a second electrical circuit with the second switch, causing the eccentric cam to rotate and causing a latching action by the hook

wherein the first electrical switch, the second electrical switch, and the electrical motor are electrically connected to each other through a printed circuit board which receives electrical power through a connector port via a plug on a wire harness wherein power is transmitted through electrical connector pins on the connector port, further wherein the electrical connector pins of the connector port extend into and penetrate through the printed circuit board.

2. The latching apparatus of claim 1, wherein the latching apparatus is constructed with a rectangular sheet metal chassis.

3. The latching apparatus of claim 2, wherein the rectangular sheet metal chassis is an elongated, generally flat part having flanges on three sides to provide rigidity.

4. The latching apparatus of claim 3, wherein the first and second electrical switches and the electrical motor are fixedly mounted at a proximal end of the chassis and the push rod and hook are movably mounted at a distal end of the chassis.

5. The latching apparatus of claim 1, wherein the spring presses the first actuator rod against a lever of the first electrical switch when the first actuator rod is in the proximal position.

6. The latching apparatus of claim 5, wherein the first actuator rod pivotally engages the push rod through a rotational link which rotates about a pivotal axle which is rotationally fixed to the chassis.

7. The latching apparatus of claim 6, wherein the push rod and the first actuator rod are rotationally fastened to the rotational link through separate pivotal axles.

8. The latching apparatus of claim 7, wherein the rotational link reverses a directional sense of the push rod so that when the first actuator rod moves to the proximal position, the push rod moves to the distal position.

9. The latching apparatus of claim 1, wherein the distal end of the second actuator rod engages a slot so that as the eccentric cam rotates, the second actuator rod and the hook may both move along the slot.

10. The latching apparatus of claim 9, wherein a sheet metal bridge is positioned over the second actuator rod to prevent it from disengaging from the slot.

11. The latching apparatus of claim 10, wherein the hook engages a peg when in its distally extreme position.

12. A latching apparatus having a proximal end and a distal end and movable between a non-latching state and a latching state, the latching apparatus comprising:

a first electrical switch, a second electrical switch, an electrical motor driving an eccentric cam, a push rod having a proximal end and a distal end, a hook, a spring, and a first actuator rod and a second actuator rod having a proximal end and a distal end;

wherein when the latching apparatus is in the non-latching state:

the first actuator rod is in a proximal position wherein:

a. the proximal end of the first actuator rod is engaged with the spring, the spring being in a relaxed state, thereby making contact with the first electrical switch to form a first closed electrical circuit with the first electrical switch, and

b. the distal end of the first actuator rod is engaged with the proximal end of the push rod by a pivoting link member, the push rod being in a distal position; and

the second actuator rod is in a proximal position wherein:

c. the proximal end of the second actuator rod is engaged with the eccentric cam, the eccentric cam being in contact with but not activated by the second switch, and

d. the distal end of the second actuator rod is engaged with the hook, the hook being in a non-latching state; and

wherein when the latching apparatus is in the latching state:

the first actuator rod is in a distal position wherein:

a. the door of the apparatus will engage the push rod, so as to move the push rod toward a proximal position and wherein movement of the push rod actuates the first actuator rod to move to a distal position causing the proximal end of the first actuator rod, engaged with the spring, to break contact with the first electrical switch to form an electrical open and

b. the distal end of the first actuator rod is engaged with the proximal end of the push rod by a pivoting link member in a manner which allows the push rod to be in a proximal position; and

the second actuator rod is in a distal position wherein:

c. the proximal end of the second actuator rod, engaged with the eccentric cam, is in contact with and is activated by the second switch to axially translate the second actuator rod to the distal position, and

d. the distal end of the second actuator rod, engaged with the hook, moves the hook to a latching position,

wherein when the pushrod is moved towards the proximal end of the latching apparatus, the first electrical circuit formed by the first switch is broken, thereby forming a second electrical circuit with the second switch which energizes and causes rotation of the electric motor which causes the eccentric cam to rotate to cause a latching action by the hook

wherein electrical power to the first electrical switch, the second electrical switch and the electrical motor is supplied through a single point power connection established by connecting a plug to a receptacle within a connector port.

13. The latching apparatus of claim **12**, wherein the receptacle of the connector port comprises connector pins.

14. The latching apparatus of claim **13**, wherein the connector pins are oriented within the receptacle in an asymmetrical manner to require a polarized connection between the plug and the connector port which requires the plug to be oriented to a specific side to engage the connector port.

15. The latching apparatus of claim **14**, wherein the receptacle of the connector port comprises a first horizontal row and a second horizontal row of connector pins, wherein the first horizontal row and the second horizontal row of connector pins form an asymmetrical pattern of connector pins within the receptacle.

16. The latching apparatus of claim **15**, wherein the receptacle of the connector port comprises six (6) connector pins within the first horizontal row and six (6) connector pins within the second horizontal row.

17. The latching apparatus of claim **16**, wherein the first electrical switch, the second electrical switch and the electrical motor are electrically connected to each other through a printed circuit board which receives electrical power through the connector port and wherein the connector pins of the connector port extend into and penetrate through the printed circuit board.

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